What’s New in Rapid Testing for HIV and HCV

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Account Manager, Public Health - East

Objectives

- Benefits of Rapid Testing for HIV
- Platforms for Rapid HIV Testing vs. conventional testing
- Latest advances in HCV Rapid Testing
"The OraQuick® Test is the first FDA-approved rapid test that can provide test results in one visit and in less than half an hour. By virtue of its speed, simplicity, and its portability, countless more Americans will be able to find out their HIV status immediately."

HHS Secretary Tommy G. Thompson
FDA Press Conference - November 7, 2002
Source of HIV Tests and Positive Tests

- 38% - 44% of adults age 18-64 have been tested
- 16-22 million persons age 18-64 tested annually in U.S.

<table>
<thead>
<tr>
<th>Source of HIV Test</th>
<th>HIV tests*</th>
<th>HIV+ tests**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private doctor/HMO</td>
<td>44%</td>
<td>17%</td>
</tr>
<tr>
<td>Hospital, ED, Outpatient</td>
<td>22%</td>
<td>27%</td>
</tr>
<tr>
<td>Community clinic (public)</td>
<td>9%</td>
<td>21%</td>
</tr>
<tr>
<td>HIV counseling/testing</td>
<td>5%</td>
<td>9%</td>
</tr>
<tr>
<td>Correctional facility</td>
<td>0.6%</td>
<td>5%</td>
</tr>
<tr>
<td>STD clinic</td>
<td>0.1%</td>
<td>6%</td>
</tr>
<tr>
<td>Drug treatment clinic</td>
<td>0.7%</td>
<td>2%</td>
</tr>
</tbody>
</table>

*National Health Interview Survey, 2002
**Suppl. to HIV/AIDS surveillance, 2000-2003

Objectives

- **Benefits of Rapid Testing for HIV**
- Platforms for Rapid HIV Testing vs. conventional testing
- Latest advances in HCV Rapid Testing
Benefits of Rapid Testing for HIV

- Overcome major barriers to individuals with HIV infection knowing their status
  - Testing opportunities to medical and nonmedical settings
  - Facilitates patients receiving test results the same day
- Provides greater access to testing, prevention and care
- Reduce the number of new infections and reduce morbidity and mortality

Rapid HIV Tests are Preferred Tests

- Patients and providers prefer rapid HIV tests to conventional EIAs
  - 1038/1148 people seeking HIV testing at 24 clinical and nonclinical settings preferred Oral test vs serum EIA (95%)
  - 13% said they wouldn’t have been tested that day if a RT wasn’t available

Objectives

• Benefits of Rapid Testing for HIV
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Trade Offs to Rapid Tests over Conventional Tests

• Good news: More HIV+ people will receive their results

• Bad news: Some people will receive a false+ result before a confirmatory test is done
Turnaround Times for Rapid Test Results, Point-of-Care vs Lab Testing

- Point-of-care testing: median 45 min
  -(range 30 min –2.5 hours)

- Same test in Laboratory: median 3.5 hours
  -(range 94 min –16 hours)

MMWR 52:36, Sept 16, 2003
OraQuick ADVANCE® Rapid HIV-1/2 Antibody Test

- Ensure Complete Accurate Results -
  - Reliable results in just 20 minutes
  - Greater than 99% accuracy
  - The only rapid HIV test for use with:
    - Oral fluid specimens
    - Venipuncture whole blood
    - Fingerstick whole blood, and
    - Plasma (moderately complex)
  - Maximum reimbursement

- Test with Ease and Convenience -
  - Simple two-step oral fluid procedure
  - Portable and requires no special lab equipment
  - Built-in procedural control
  - CLIA-waived (oral fluid, venipuncture and fingerstick whole blood specimens only)
OraQuick ADVANCE® Clinical Features Operating Principle

Colloidal gold particles containing HIV antibodies bind to the HIV antigen "T" line forming a visible red band. Colloidal gold particles containing Human antibodies bind to the Anti-Human Antibodies "C" line forming a visible red band. Any remaining colloidal gold particles are captured and retained by the absorbent pad.

Sensitivity Test Results

Sensitivity: The ability to detect a true positive.

Sensitivity – Combined clinical trial results performed on fingerstick whole blood specimens in high-risk and known HIV infected individuals

536 (OraQuick® Reactive Results) / 538 (Confirmed Positives) = 99.6%
Specificity Test Results

**Specificity**: The ability to detect a true negative.

**Specificity** – Combined clinical trial results performed on fingerstick whole blood specimens in high-risk and low-risk never screened before individuals

\[
\frac{1856 \text{ (OraQuick® Non-Reactive Results) }}{1856 \text{ (Confirmed Negatives) }} = 100.0\%
\]

Clinically Proven

Greater than 99% accurate.

<table>
<thead>
<tr>
<th>Claim</th>
<th>Sensitivity</th>
<th>Specificity</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIV-2*</td>
<td>100.0%</td>
<td>-</td>
</tr>
<tr>
<td>Oral Fluid</td>
<td>99.3%</td>
<td>99.8%</td>
</tr>
<tr>
<td>Fingerstick Whole Blood</td>
<td>99.6%</td>
<td>100.0%</td>
</tr>
<tr>
<td>Plasma</td>
<td>99.6%</td>
<td>99.9%</td>
</tr>
</tbody>
</table>

Fingerstick whole blood clinical results

*HIV-2 (Based on >800 banked serum/plasma specimens. In addition, FSWB and OF tests were done on 3 HIV-2 infected individuals). Specificity not reported. Sensitivity and specificity for venipuncture whole blood not reported.
<table>
<thead>
<tr>
<th>Test</th>
<th>Sensitivity</th>
<th>Specificity</th>
</tr>
</thead>
<tbody>
<tr>
<td>OraQuick Advance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Whole blood</td>
<td>99.6 (98.5-99.9)</td>
<td><strong>100</strong> (99.7-100)</td>
</tr>
<tr>
<td>• Oral fluid</td>
<td>99.3 (98.4-99.7)</td>
<td>99.8 (99.6-99.9)</td>
</tr>
<tr>
<td>• Plasma</td>
<td>99.6 (98.5-99.9)</td>
<td>99.9 (99.6-99.9)</td>
</tr>
<tr>
<td>Inverness Clearview</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Whole blood</td>
<td>99.7 (98.9-100)</td>
<td>99.9 (99.6-100)</td>
</tr>
<tr>
<td>• Serum/plasma</td>
<td>99.7 (98.9-100)</td>
<td>99.9 (99.6-100)</td>
</tr>
<tr>
<td>Trinity Uni-Gold</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Whole blood</td>
<td><strong>100</strong> (99.5-100)</td>
<td>99.7 (99.0-100)</td>
</tr>
<tr>
<td>• Serum/plasma</td>
<td><strong>100</strong> (99.5-100)</td>
<td>99.8 (99.3-100)</td>
</tr>
<tr>
<td>Reveal G2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Serum</td>
<td>99.8 (99.2-100)</td>
<td>99.1 (98.8-99.4)</td>
</tr>
<tr>
<td>• Plasma</td>
<td>99.8 (99.0-100)</td>
<td>98.6 (98.4-98.8)</td>
</tr>
<tr>
<td>Multispot</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Serum/plasma</td>
<td>100 (99.9-100)</td>
<td>99.9 (99.8-100)</td>
</tr>
<tr>
<td>• HIV-2</td>
<td>100 (99.7-100)</td>
<td></td>
</tr>
</tbody>
</table>

**Ruling out False Positives**

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td><strong>100</strong></td>
<td>98</td>
<td>97</td>
<td>99</td>
<td>98</td>
</tr>
<tr>
<td>5</td>
<td><strong>100</strong></td>
<td>96</td>
<td>95</td>
<td>98</td>
<td>96</td>
</tr>
<tr>
<td>2</td>
<td><strong>100</strong></td>
<td>91</td>
<td>87</td>
<td>95</td>
<td>91</td>
</tr>
<tr>
<td>1</td>
<td><strong>100</strong></td>
<td>83</td>
<td>77</td>
<td>90</td>
<td>83</td>
</tr>
<tr>
<td>0.5</td>
<td><strong>100</strong></td>
<td>71</td>
<td>53</td>
<td>83</td>
<td>71</td>
</tr>
<tr>
<td>0.3</td>
<td><strong>100</strong></td>
<td>60</td>
<td>50</td>
<td>75</td>
<td>60</td>
</tr>
<tr>
<td>0.1</td>
<td><strong>100</strong></td>
<td>33</td>
<td>25</td>
<td>50</td>
<td>33</td>
</tr>
</tbody>
</table>

*Based on point estimate for specificity from the Mother-Infant Rapid Intervention at Delivery Study, CDC JAMA 2004; 292:219-23
Non-reactive result

A Non-Reactive test result means that HIV-1 and HIV-2 antibodies were not detected in the specimen.

The test result is interpreted as NEGATIVE for HIV-1 and HIV-2 antibodies.

Follow CDC Guidelines to inform subject of test result and interpretation.
Reactive result

A Reactive test result means that HIV-1 and/or HIV-2 antibodies have been detected in the specimen.

The test result is interpreted as PRELIMINARY POSITIVE for HIV-1 and/or HIV-2 antibodies.

Follow CDC Guidelines to inform subject of test result and interpretation.

Invalid result

An Invalid test result means that there was a problem running the test, either related to the specimen or to the Device.

IT CANNOT BE INTERPRETED.

Repeat test with a new Pouch and a new oral fluid, fingerstick or venipuncture whole blood, or plasma sample.
Objectives

- Benefits of Rapid Testing for HIV
- Platforms for Rapid HIV Testing vs. conventional testing
- Latest advances in HCV Rapid Testing

The future....

- Next generation HIV tests
- Rapid Point-of-Care HCV Tests
Detection of HIV by Diagnostic Tests

- Symptoms
- P24 Antigen
- HIV RNA
- HIV EIA*  
- Western blot

Weeks since infection  
0 1 2 3 4 5 6 7 8 9 10


4th Generation HIV Screening Tests

- Inclusion of antibody/antigen detection
- Acute HIV detection  
  - As early as 8-10 days???
- What do we use as a confirmatory test?
Hepatitis C Screening

- Estimated 4 million undiagnosed HCV cases
- No rapid POC test in the US for diagnosis of HCV infection
- Identification of infected individuals in public health clinics
- Co-infection with HIV
- OraQuick HCV Rapid Antibody Test

OraQuick HCV Rapid Antibody Test Device
Basic Design of the Prototype

- Anti-Human Antigen
- HCV Antigens Core, NS3, NS4
- Colloidal Gold Conjugated to Protein A
- Human Antibodies
- HCV Antibodies
- Control “C” Line
- Test “T” Line

This test device has been developed for application on venous-whole blood, finger-stick whole blood, serum, plasma, and oral specimens
Comparison of HCV Seroconversion Sensitivity of OraQuick HCV Prototype with HCV EIA

<table>
<thead>
<tr>
<th>Number of Panels Tested</th>
<th>Number of Concordant Visual Results</th>
<th>Number Detected Earlier by HCV EIA</th>
<th>Number Detected Earlier by OraQuick</th>
<th>Average Time to Detection by HCV EIA (Days)</th>
<th>Average Time to Detection by HCV OraQuick (Days)</th>
<th>Mean Differential Sensitivity (Days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>19</td>
<td>9</td>
<td>0</td>
<td>10</td>
<td>61.3</td>
<td>56.4</td>
<td>4.9 (1.4-8.3)</td>
</tr>
</tbody>
</table>

OraQuick HCV Rapid Antibody Test Device Sensitivity (n=122) in 5 matched Sample Matrices

*subject negative for oral fluid only, positive in 4 other matrices; Subject status is EIA+, RIBA+, PCR-
**OraQuick HCV Rapid Antibody Test Device**

**Specificity (n=450) in 5 matched Sample Matrices**

<table>
<thead>
<tr>
<th>HCV EIA</th>
<th>+</th>
<th>-</th>
</tr>
</thead>
<tbody>
<tr>
<td>+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*subject confirmed EIA+, RIBA+, PCR+
**subject positive for plasma and serum only negative in 3 other matrices

**OraQuick HCV Rapid Antibody Test Device**

**Specificity and Sensitivity (95% CIs)**

<table>
<thead>
<tr>
<th>Matrix</th>
<th>Specificity</th>
<th>Sensitivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oral Fluid</td>
<td>100% (99.2-100%)</td>
<td>99.2% (95.5-100%)</td>
</tr>
<tr>
<td>Venous Whole Blood</td>
<td>100% (99.2-100%)</td>
<td>100% (97.0-100%)</td>
</tr>
<tr>
<td>Fingerstick Blood</td>
<td>100% (99.2-100%)</td>
<td>100% (97.0-100%)</td>
</tr>
<tr>
<td>Plasma</td>
<td>99.8% (98.8-100%)</td>
<td>100% (97.0-100%)</td>
</tr>
<tr>
<td>Serum</td>
<td>99.8% (98.8-100%)</td>
<td>100% (97.0-100%)</td>
</tr>
</tbody>
</table>
Summary

- Benefits of Rapid Testing for HIV
- Platforms for Rapid HIV Testing vs. conventional testing
- Latest advances in HCV Rapid Testing
- HIV and HCV testing is continuing to evolve

Thank you for your time and attention!

Questions???